HAL open science

Structuring food for improving nutrient bioavailability: the case of dairy gels

Didier Dupont, Florence Barbe, Steven Le Feunteun, Olivia Ménard, Yann Le Gouar, Amélie Deglaire, Juliane Floury, Didier Remond, Béatrice Laroche

To cite this version:

Didier Dupont, Florence Barbe, Steven Le Feunteun, Olivia Ménard, Yann Le Gouar, et al.. Structuring food for improving nutrient bioavailability: the case of dairy gels. 29. EFFoST International Conference, Nov 2015, Athènes, Greece. hal-01195522

HAL Id: hal-01195522

https://hal.science/hal-01195522

Submitted on 3 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Important notes:

Do **NOT** write outside the grey boxes. Any text or images outside the boxes **will** be deleted.

Do **NOT** alter the structure of this form. Simply enter your information into the boxes. The form will be automatically processed – if you alter its structure your submission will not be processed correctly.

Do not include keywords – you can add them when you submit the abstract online.

Title:

Structuring food for improving nutrient bioavailability: the case of dairy gels

Authors & affiliations:

D. Dupont[*1], F. Barbe[1], S. Le Feunteun[2], O. Menard[1], Y. Le Gouar[1], A. Deglaire[1], J. Floury[1], D. Rémond[3], B. Laroche[4]*

[1] INRA, Rennes, France; [2] INRA, Grignon, France ; 3 INRA, Clermont-Ferrand/Theix, France ; 4 INRA, Jouy-en-Josas, France

didier.dupont@rennes.inra.fr

Abstract: (Your abstract must use **Normal style** and must fit in this box. Your abstract should be no longer than 300 words. The box will 'expand' over 2 pages as you add text/diagrams into it.)

The food matrix structure is one of the key drivers to control the fate of food in the digestive tract and, consequently, the kinetics of nutrient release. Milk is a raw material that can be seen as a "Lego box" from which all the constituents can be separated (cracking) and re-assembled into different structures.

The behavior in the gastrointestinal tract of milk protein matrices of identical composition but different micro and macrostructures was investigated in the present study. Six multi-canulated and catheterized mini-pigs were fed 6 different dairy matrices (raw and heat-treated milks, acid and rennet gels). Effluents from the duodenum and mid-jejunum as well as plasma from the abdominal aorta were collected over 7h. Structure was shown to drive the time of residence of food in the stomach. The liquid-gel transition led to a significant increase in the gastric emptying time. Liquid matrices generated a fast and intense peak of proteins in the intestine and amino acids in the bloodstream. Rennet gels formed a compact coagulum in the stomach that slowed down the gastric emptying and delayed the release of amino acids. A mathematical model of digestion was built from these data.

Therefore, controlling the time of residence of food in the stomach by playing on its structure allows to design products with a fast release of nutrients particularly adapted for elderlies whereas foods persisting in the stomach will induce satiety. As an example, 2 isocaloric yogurts with 3.3 and 8.4g of protein /100g respectively were manufactured and given to 11 pigs. Gastric emptying followed by scintigraphy was significantly slowed down for the protein-enriched yogurt leading to different kinetics of proteolysis.

Finally, the mechanisms of gel particle breakdown in the stomach were further investigated using biophysical methods (SAXS, imaging) and some preliminary results will be presented.